

WHAT IS CLAIMED IS:

- 1 1. A spectrometer comprising:
2 a first collection device that includes an adjustable-optical path and configured
3 to collect a first portion of a wavefront;
4 a second collection device configured to collect a second portion of the
5 wavefront;
6 combiner optics configured to interfere the first and second portions of the
7 wavefront at an image plane of the first and second collector devices to form interference
8 patterns at the image plane; and
9 a Fourier transformation module configured to derive spectral information
10 from the interference patterns.
- 1 2. The spectrometer of claim 1, wherein the Fourier transformation
2 module is configured to Fourier transform the interference patterns to derive the spectral
3 information.
- 1 3. The spectrometer of claim 1, wherein, to derive the spectral
2 information, the Fourier transform module is configured to Fourier transform the interference
3 patterns of the wavefront with the adjustable-optical path set at a variety of path lengths.
- 1 4. The spectrometer of claim 1, wherein the Fourier transformation
2 module is configured to generate a spectrogram of the wavefront.
- 1 5. The spectrometer of claim 1, wherein the Fourier transformation
2 module includes an image-capture array disposed at the image plane configured to capture
3 images of the interference pattern.
- 1 6. The spectrometer of claim 5, wherein the image-capture array includes
2 a charge-coupled device (CCD) array or a complimentary metal oxide (CMOS) array.
- 1 7. The spectrometer of claim 1, wherein the Fourier transformation
2 module includes software code configured to perform the Fourier transformation.
- 1 8. The spectrometer of claim 1, wherein the Fourier transformation
2 module includes a electronic hardware configured to perform the Fourier transformation.

1 9. The spectrometer of claim 1, wherein the first collection device is a
2 first telescope and the second collection device is a second telescope.

1 10. The spectrometer of claim 1, wherein the spectrometer is configured to
2 be deployed in space.

1 11. The spectrometer of claim 1, wherein the a first collection device
2 includes an optical-path-delay mechanism configured to vary the adjustable-optical path.

1 12. The spectrometer of claim 1, wherein the second collection device
2 includes an adjustable-optical path.

1 13. The spectrometer of claim 12, wherein the second collection device
2 includes an optical-path-delay mechanism configured to vary a path length of the adjustable-
3 optical path of the second collection device.

1 14. A spectrometer comprising:
2 a plurality of sub-aperture telescopes forming an extended aperture telescope,
3 wherein each sub-aperture telescope includes an adjustable-optical path and is configured to
4 collect a select portion of a wavefront;
5 combiner optics configured to interfere the select portions of the wavefront at
6 an image plane of the plurality of sub-aperture telescopes to form interference patterns at the
7 image plane; and
8 a Fourier transformation module configured to derive spectral information
9 from the interference patterns.

1 15. The spectrometer of claim 14, wherein, to derive the spectral
2 information, the Fourier transform module is configured to Fourier transform the interference
3 patterns with one or more of the adjustable-optical paths set at a variety of path lengths.

1 16 The system of claim 15, wherein the variety of path lengths represent a
2 relative path-length difference between one or more of the adjustable-optical paths.

1 17. The spectrometer of claim 14, wherein the Fourier transformation
2 module includes an image-capture array disposed at the image plane configured to capture
3 images of the interference pattern.

1 18. The spectrometer of claim 17, wherein the Fourier transformation
2 module is configured to Fourier transform intensity profiles generated by one or more pixel
3 included in the image-capture array.

1 19. The spectrometer of claim 17, wherein the image-capture array
2 includes a charge-coupled device (CCD) array or a complimentary metal oxide (CMOS)
3 array.

1 20. A spectrometer comprising:
2 a Fizeau interferometer having plurality of optical collectors, wherein one or
3 more of the optical collectors includes an adjustable-optical path, and wherein each optical
4 collector is configured to collect a select portion of a wavefront; and
5 a Fourier transformation module configured to derive spectral information of
6 the wavefront from interference patterns of the select portions of the wavefront.

1 21. The spectrometer of claim 20, wherein the Fizeau interferometer forms
2 an extended aperture telescope.

1 22. The spectrometer of claim 20, wherein the spectrometer is configured
2 to be deployed in space.

1 23. The spectrometer of claim 20, wherein, to derive the spectral
2 information, the Fourier transform module is configured to Fourier transform the interference
3 patterns of the wavefront with one or more of the adjustable-optical paths set at a variety of
4 path lengths.

1 24. A method for deriving a spectral information from a wavefront, the
2 method comprising:
3 collecting a plurality of select portions of a wavefront with a corresponding
4 plurality of multi-aperture telescopes;
5 interfering the select portions of the wavefront at an image plane of the multi-
6 aperture telescope to form interference patterns at the image plane; and
7 Fourier transforming the interference patterns to derive spectral information
8 for the wavefront.

1 25. The method of claim 24 further comprising generating a spectrogram
2 from the spectral information.

1 26. The method of claim 24, wherein interfering the select portions of the
2 wavefront includes interfering the select portions of the wavefront with a combiner telescope.

1 27. The method of claim 24 further comprising collecting images of the
2 interference pattern with an imaging array.

1 28. The method of claim 27, wherein Fourier transforming the interference
2 patterns includes Fourier transforming interference patterns of the interference patterns
3 collected by the imaging array.

1 29. The method of claim 24 further comprising locating the imaging array
2 at an image plane of the multi-aperture telescope.

1 30. The method of claim 24 further comprising:
2 pistoning adjustable-optical paths of the sub-aperture telescopes at plurality of
3 positions; wherein each of the interference patterns corresponds to a select piston position of
4 the adjustable-optical paths.

1 31. The method of claim 30 further comprising:
2 Fourier transforming one or more intensity profiles generated by a one or more
3 pixels, respectively, of an image-capture array.